

## CHAPTER 20 - LIFTING DEVICES AND EQUIPMENT

### 20.1 DEFINITIONS/ACRONYMS

Certified Operator- A person who has completed designated classroom training, passed the required medical examination, and received hands-on-training for the specific device to be operated.

Competent Person- An individual who, by way of training and/or experience, is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, and has the authority to take corrective actions or stop work.

Critical Lift - Lifts where a loss of control could result in loss of life, loss of or damage to flight hardware or a lift involving special, high dollar items, such as spacecraft, one-of-a-kind articles, or major facility components, etc., whose loss would have serious programmatic impact. Critical lifts also include the lifting of personnel with a crane, lifts where personnel are required to work under a suspended load and operations with special personnel and equipment safety concerns beyond normal lifting hazards. (See Appendix A)

CS - NASA Civil Servant Employees – An employee of the National Aeronautics and Space Administration (NASA) that receives their pay and benefits from NASA.

Dummy Load - A test load used to simulate the real load; typically a test weight

Failure Modes and Effects Analysis (FMEA) - A systematic, methodical analysis performed to identify and evaluate all identifiable component failure modes at a prescribed level and to specify the resultant effect of the failure modes.

Lifting Devices and Equipment - Any crane, hoist, mobile crane, winch, aerial platform, powered industrial truck, hydra-set, hooks, slings, spreader beams used to lift, hold, transport, and lower a load.

Hazard Analysis - Identification and evaluation of existing and potential hazards and the recommended mitigation for the hazard sources found.

[NASA STD 8719.9](#) - NASA Standard for Lifting Devices and Equipment

Non-Critical Lift - Non-critical lifts involve routine minimal hazard lifting operations and are governed by NASA Standard 8719.9, standard industry rules and practices except where indicated by this chapter.

Operational Test - A test to determine if equipment (limit switches, emergency stop controls, brakes, etc.) is functioning properly.

Periodic Load Test - A test performed at predetermined intervals with a load greater than or equal to the rated load, but less than the proof load.

Qualified Person - A person who, by possession of a recognized degree in an applicable field or a certificate of professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

Shall - The word “shall” indicates that the rule is mandatory and must be followed.

Should - The word “should” indicates that the rule is recommended, the advisability of which depends on the facts in each situation.

Support Service Contractor - On Site Contract Employees - Any supplier, distributor, vendor, or firm that furnishes supplies or services to or for the GRC who have some type of assigned or resident space at GRC.

## 20.2 SCOPE

This chapter describes the means for which NASA STD 8719.9 shall be safely implemented at GRC, including certification requirements, and use of lifting devices to all NASA GRC Civil Servant employees, all on-site Support Service Contractors and construction and maintenance contractors and subcontractors. The design, fabrication, installation, maintenance, repair, inspection, and testing of overhead crane and hoist systems and lifting devices shall be done in accordance with the regulations and procedures of the Occupational Safety and Health Standards, 29 CFR 1910, Subpart N; the American National Standards Institute (ANSI); the Crane Manufacturers Association of America, Inc. (CMAA); and, from NASA Standard for Lifting Devices and Equipment 8719.9. This chapter applies to overhead cranes, mobile cranes, hoists, personnel-lifting devices, forklifts and slings or lifting fixtures used at GRC.

## 20.3 APPLICABILITY

This Chapter applies to Glenn Research Center (GRC) at Lewis Field and Plum Brook Station. The provisions, responsibilities, and requirements as set forth in this chapter applies to all NASA GRC Civil Servants employees, all NASA Support Service Contractors, and all construction and maintenance contractors and subcontractors, and, other Government agency employees, and other organizations that perform lifting activities within the confines of the GRC.

## 20.4 GENERAL

GRC has established personnel safety certification standards, in accordance with NASA Standard 8719.9, to minimize risk to personnel and property, ensuring individuals performing lifting functions are trained to perform their work in accordance with applicable safety and health standards, that high-risk operations are conducted safely and

the highest standards of safety and performance are maintained while accomplishing the Center's mission.

## 20.5 RESPONSIBILITIES

The responsibility for the implementation and maintenance of GRC safety policies and standards is delegated to the management level. Depending on the task, the personnel safety certification process shall be managed by either the head of the organization, the Facility Manager, or the first-line supervisor where the function is being performed. All personnel involved with lifting devices should be familiar with [NASA Standard for Lifting Devices and Equipment 8719.9](#).

### 20.5.1 Safety Branch

- a. The Safety Branch provides guidance and direction for center-wide activities that involve crane and lifting device safety.
- b. The Safety Branch is responsible for programmatic audits of the program.
- c. Provides guidance and review of Critical Lift Procedures, related Job Hazard Analysis or Lifting Device Equipment hazard analysis for equipment to be used for critical lifts.

### 20.5.2 Supervisors

Supervisors are responsible for ensuring that personnel who operate lifting devices are trained and certified in compliance with NASA Standard 8719.9, and this Chapter. Supervisors shall be responsible for maintaining training records and medical records and for ensuring that recertification and refresher training is conducted prior to the expiration date of an employee's certification. Supervisors are also responsible for retaining a list of specific devices employees are trained to operate.

### 20.5.3 Employees

All employees at GRC, who design, fabricate, construct, maintain, repair, and operate overhead cranes, mobile cranes, forklifts, and any lifting devices are responsible for understanding this chapter and conforming to its practices and provisions.

#### 20.5.3.1 Operators

Daily documented inspections shall be performed by the certified operator prior to first use each day of any and all lifting devices and equipment, including overhead cranes, hoists, winches, powered industrial trucks, mobile cranes, derricks, jacks, hooks, slings and mobile aerial platforms. Daily inspection documents should be maintained at a location accessible to all operators.

## **20.5.4 Facilities and Test Engineering Division**

The Facilities Division is responsible for maintaining, inspecting (monthly and annually), testing and record keeping for all NASA-owned lifting devices and equipment at Glenn Research Center at Lewis Field as per NASA 8719.9.

## **20.5.5 Plum Brook Station**

Plum Brook Management Office (PBMO) is responsible for maintaining, inspecting (monthly and annually) testing, and record keeping for all NASA- owned lifting devices and equipment at Plum Brook Station as per NASA Standard 8719.9.

## **20.5.6 Competent Person**

The competent person shall not be the lifting device operator but can designate a person to operate a lifting device provided the certification operators requirements have been met in accordance this chapter. For construction and maintenance activities, the competent person shall be listed on the applicable Site Specific Health and Safety Plan (HASP). (See Chapter 17 of the Glenn Safety Manual for HASP requirements.)

## **20.5.7 Lifting Device Equipment Manager**

The Center Director shall designate in writing at least one person and an alternate, with appropriate background in lifting devices, lifting operations, lifting equipment industry standards and an understanding of lifting safety, as the Center's Lifting Devices and Equipment Manager (LDEM). The LDEM and safety organization are responsible for implementation and enforcement of NASA Standard for Lifting Devices and Equipment 8719.9 and the contents of this Chapter.

## **20.5.8 Quality Management Office (QMO)**

The QMO is responsible for:

- a) Providing assistance when required for programmatic audits of the program.
- b) Providing guidance and review of Critical Lift Procedures, related Job Hazard Analysis or Lifting Device Equipment hazard analysis for equipment to be used for critical lifts.
- c) LDEM support

# **20.6 CERTIFICATION DOCUMENTATION**

## **20.6.1 The official documents used to process individuals for safety certification of lifting devices are:**

- a. A certificate of classroom training in:
  - safety and emergency procedures
  - general performance standards

- requirements
- pre-operational checks, and
- methods for detecting safety related defects and symptoms

The specific requirements are every four (4) years, for cranes, hoists and mobile cranes, and every three (3) years for forklifts.

- b. Physical examination requirements for Support Service Contractors use Medical Criteria and Medical Clearance Forms NASA C-142, for NASA Civil Servants use Medical Criteria and Medical Clearance Forms NASA C-143.

**20.6.2 The documents to be used for proof of meeting the requirements for operating a lifting device are a forklift license issued by the instructor and shall be in the possession of the operator.**

The license shall include:

- a. The employees' name
- b. Date of training
- c. Name of the instructor
- d. Company name
- e. Issued date
- f. Expiration Date
- g. List the type or class of forklift

**20.6.3 Crane License For On-Site Contracting Employees - A crane/lifting device license issued by the instructor and shall be in the possession of the operator. This license shall include:**

- a. The employees' name
- b. Name of the instructor
- c. Name of the instructor's company
- d. Expiration Date

**20.6.4 Crane License For NASA Civil Servants – A crane/lifting device license issued by the instructor, or the Safety Branch, shall be in the possession of the operator. This license shall include:**

- a. The employee's name
- b. Authorized signature (Safety Branch, Training Office, or Supervisor/Lead Tech
- c. Expiration Date
- d. If issued by Safety Branch - List the locations of cranes/hoists employee is authorized to operate

## **20.7 MEDICAL SURVEILLANCE REQUIREMENTS**

**20.7.1 The work performed by individuals utilizing lifting devices requires medical surveillance, and strict adherence to the physical examination requirements shall be as follows:**

- a. For Overhead Cranes, Mobile Cranes, Hoists, and Portable Lifting Cranes personnel shall undergo and pass a medical examination every four years at the time of their recertification. Visual and hearing acuity tests are required each year in between recertification, in accordance with NASA C-142 for SSC, and C-143 for NASA Glenn CS employees.
- b. All Forklift Operators shall undergo and pass a medical examination for pre-certification and every three years at the time of their recertification, with visual and hearing acuity tests required each year in between recertification, in accordance NASA C-142 for SSC, and C-143 for NASA Glenn CS employees.

## **20.8 TRAINING REQUIREMENTS**

### **20.8.1 Overhead Cranes, Mobile Cranes, Hoists, Portable Lifting Cranes**

As a minimum, and prior to operating overhead cranes, mobile cranes, hoists, or portable lifting cranes, personnel shall successfully complete the classroom training for certification of the applicable device(s). Hands-on training is required for initial use. Classroom training shall be completed at least every four years. Operators shall complete an annual review of the items in Section 20.8.1 of this Chapter utilizing NASA Glenn Research Center Learning Center video library, a formal review session at the management level, a classroom course through NASA Safety Training Center, or a course of equal or greater value applicable to lifting device operators.

The required training qualifications should include but are not limited to the following paragraphs:

- a. Safety and Emergency procedures
- b. Equipment inspection procedures
- c. Positioning of crane for lift
- d. Outrigger deployment (mobile cranes)
- e. Determination of center of gravity
- f. Determination of load weight
- g. Use of common slings and hitches
- h. Hand-signal motions (empty)
- i. Lifting and braking with load
- j. Hand-signal motions (loaded)

## **20.8.2 Powered Industrial Trucks (Forklift) Operators**

As a minimum, and prior to operating forklifts, personnel shall successfully complete the classroom training and hands-on for initial safety certification for the required device(s), and shall be completed at least every three years. Operators shall also complete an annual review of the items utilizing NASA Glenn Research Center Learning Center video library, a formal review session, or a classroom course through NASA Safety Training Center or a course of equal or greater value applicable to lifting device operators.

The required training qualifications should include but are not limited to the following paragraphs:

- a. Safety and Emergency procedures,
- b. Pre-operational checks
- c. Demonstrating proper use of forklift controls,
- d. Following proper procedures for unattended forklift,
- e. Demonstrating competency in basic maneuvering skills,
- f. Demonstrating competency in picking up a load
- g. Demonstrating competency in driving with a load
- h. Demonstrating competency in stacking a load
- i. Demonstrating competency in loading/unloading a trailer, rail car, or other vehicle.

## **20.9 AERIAL LIFT OPERATORS**

Aerial Lift Operators shall be trained to operate the lift equipment prior to use. The following types of vehicle-mounted aerial devices used are to elevate personnel to job sites above ground: (1) Extensible boom platforms; (2) aerial ladders; (3) articulating boom platforms; (4) vertical towers; (5) a combination of any of the above. These devices are made of metal, wood, fiberglass reinforced plastic (FRP), or other material and are powered or manually operated. They may or may not be capable of rotating about a substantially vertical axis. See Chapter 34 GUIDELINES FOR AERIAL LIFTING EQUIPMENT for more information.

## **20.10 CRITICAL LIFT REQUIREMENTS**

Refer to section 20.1 of this Chapter for definitions of Critical and Non-Critical Lifts. See Appendix A Critical Lift Classification Guide, or contact the Safety Branch.

### **20.10.1 Critical Lifts**

Besides the training, examination, licensing, and renewal requirements for non-critical lifts, operators that are being certified to perform critical lifts must be knowledgeable of the specific hazards and special procedures associated with the a critical lift. Operators also must demonstrate proficiency and operating finesse with the crane to be used for the particular critical lift or alternately be directly supervised by a certified operator during

the demonstration of proficiency. The operator's supervisor will maintain a list of specific lifting devices for critical lifts that the operator is certified to operate.

### 20.10.2 Critical Lift Requirements

Once a lift has been determined to be critical, a series of requirements shall be met: (See Appendix B)

- a. Hazard Analysis - A recognized safety hazard analysis, such as fault tree analysis, FMEA, Operating and Support Hazard Analysis (O&SHA), shall be performed on all lifting devices used for critical lifts. The analysis shall, as a minimum, determine potential sources of danger, identify failure modes, and recommend resolutions and a system of risk acceptance for those conditions found in the hardware-facility-environment-human relationship that could cause loss of life, personal injury, and loss of or damage to the crane, facility, or load. The analysis shall be done as part of the initial evaluation process for critical lift compliance and prior to use in a critical lift, included in the crane documentation, and updated as required to reflect any changes in operation and/or configuration. Alternately, a Job Hazard Analysis could be completed to identify and control potential hazards and to ensure safe working conditions. (See Chapter 33 of the Glenn Safety Manual) Upon completion, the safety hazard analysis shall be submitted to the Safety Branch for review.
- b. Specific Written Procedures - A written procedure or process plan, specific to the lift being conducted, shall be prepared and submitted to the Safety Branch, and Quality Management Office (QMO) at least 5 working days of the lift for review. Prime Contractors using GRC facilities will prepare and approve their own critical lift procedures before submitting them to the identified GRC Manager for necessary reviews by the Program Manager, Safety Branch and QMO. (See Appendix C Sample Template).
- c. Pre-Lift Meeting - Upon review of the Critical Lifting Procedure by the Safety Branch and approval of the written procedure by the QMO, a pre-lift meeting shall be held. At this meeting the crane operator, rigger, designated signal person, critical lift monitor, Quality representative/Safety representative, and all personnel involved with the critical lift, shall review the written operating procedures including crane operations, emergency steps, communication requirements, and special requirements including checklists, inspection requirements, hazard analysis, and a lifting device hazard analysis. A review shall be done of assigned responsibilities, including crane operator, signal person, rigger, critical lift monitor, and any personnel directly involved with the critical lift.
- d. Critical Lift Monitors - Shall be designated for all critical lift operations. This monitor can be a safety professional, a supervisor, an engineer, or a task leader and will have no responsibilities other than to monitor the operation for compliance with the written procedure developed.
- e. Critical Lift Load Testing - Cranes used frequently for critical lifts shall have completed a Periodic Load Test and an Operational test annually. Cranes used

infrequently for critical lifts shall have a Periodic Load test and an Operational test before the critical lift is scheduled if more than a year has elapsed since the last Periodic Load and Operational tests. Lifting equipment shall be load tested per NASA Standard for Lifting Devices and Equipment 8719.9 and a visual inspection of all lifting equipment shall be performed for cracks, deformations, gouges, galling, kinks, crushed areas, corrosion, and for proper configuration prior to every lift.

- f. Critical Lift Operations – All critical lifts shall comply with paragraph 20.12.2 Operations and additionally:
1. A Pre-ops check to demonstrate operational readiness shall be performed and a safety zone established before initiating operations.
  2. Before each lift or series of lifts, the operator shall test the functional operation of the upper and lower limit switches with no load on hook.
  3. Operators shall adhere to all precautions, procedures and processes of the Critical Lift plan.

Safety Branch and QMO are only responsible for critical lifting operations that are performed at GRC facilities or involve Government Furnished Equipment. Off site lifting operations performed by a contractor are the responsibility of the contractor to follow OSHA and NASA lifting requirements as required.

## **20.11 OFF SITE CONTRACTOR REQUIREMENTS**

### **20.11.1 Off-Site Contractors**

Only designated personnel shall be permitted to operate a crane or Lifting Device(s) at GRC. The designated person shall provide to the COTR proof of classroom training for the lifting device(s) to be used and receive hands-on training for the device(s) to be used. The designated person shall comply with Section 20.12.2 and Section 20.13.5 Operations, and with all safe operating procedures, including a practical test on the crane(s) that will be operated. This practical test shall be administered by a licensed lifting device operator for that specific lifting device. It is the responsibility of the competent person to assure compliance with this section.

## **20.12 OVERHEAD CRANE AND LIFTING DEVICE SYSTEMS**

### **20.12.1 Description**

This section establishes minimum standards for the design, testing, inspection, maintenance, personnel certification, and operation for overhead and gantry cranes, including under hung, monorail, and jib cranes.

### **20.12.2 Purchase of Lifting Devices**

All purchase requests for lifting devices shall be routed for approval through the Facilities and Division at Lewis Field or the Plum Brook Management Office at Plum Brook. Identification and specification requirements will be assigned. Upon receipt, the lifting device(s) will be inspected by a certified inspector for conformance to those requirements.

### **20.12.3 Testing, Tagging, Emergency Cutoff Switch, Markings**

All testing and related requirements and procedures shall be completed in accordance with NASA Standard for Lifting Devices and Equipment 8719.9

### **20.12.4 Operations**

Safe operation of an overhead crane or Lifting Device(s) requires the following:

- a. Training - Only personnel having the required training and the authorization of the supervisor shall be permitted to operate the lifting equipment. Training requirements are outlined in Sections 20.8 of this chapter.
- b. Inspection - Prior to the operator's first use each day or shift, the operator of the crane or Lifting Device shall visually inspect it for mechanical soundness and shall perform a functional integrity test (i.e., ascertain that all equipment performs as intended). If anything questionable is found, the unit shall be removed from service, locked out and tagged out until the problem is resolved. (See Chapter 9 of the Glenn Safety Manual) .
- c. Proper load - The operator shall never pick up a load in excess of the rated capacity marked on the unit.
- d. Correct load movement - The load should never be picked up with a side pull; it should be kept as near to the ground as practical. No one shall ever ride the hook or load, and a suspended load shall never be left unattended.
- e. When operating a crane or hoist with a wire rope, the operator should never lay the hook on the floor, thereby creating a slack condition. Furthermore, when picking up or lowering the load, the operator shall maintain at least two full wraps of rope on the hoist drum at all times.
- f. Personnel shall not be located under suspended or moving loads unless the operation adheres to the OSHA-approved NASA Alternate Standard for Suspended Load Operations. This includes occupied buildings, offices, shops etc.
- g. All loads hoisted above shoulder level should have a tag line attached.

## **20.13 SLINGS AND RIGGING EQUIPMENT**

### **20.13.1 Description**

This section applies to slings, rigging equipment, linkage mechanisms, and all structural members (e.g., spreader beams) that extend between a lifting hook on a crane or hoist and the object being lifted.

### **20.13.2 Purchase of rigging equipment**

All purchase requests for rigging hardware and associated equipment shall be routed for approval through the Facilities and Test Engineering Division at Lewis Field or the Plum Brook Management Office at Plum Brook. Identification and specification requirements will be assigned. Upon receipt, the lifting device(s) will be inspected by a certified inspector for conformance to those requirements.

### **20.13.3 Testing - Two tests are required for rigging equipment:**

- a. Proof load test - Prior to first use, all new, extensively modified, repaired, or altered rigging equipment shall undergo a proof load test. Proof load tests performed by the manufacturer are acceptable if the necessary test certification papers or tags are provided.
- b. Periodic rated load test - All lifting devices shall undergo a periodic load test once every 4 years for standard lifting devices and annually for lifting devices used for critical lifts.

### **20.13.4 Tagging**

Following the load test, all rigging equipment shall be given a permanently affixed tag with an identity number, the rated capacity (in pounds), proof load applied (in tons), the date of the last periodic load test (when applicable), and the date of the next scheduled load test.

### **20.13.5 Operations - Safe operation of slings and other rigging equipment requires:**

- a. Inspection - Prior to use, the operator shall check slings or other rigging equipment for defects such as cracks, deformations, gouges, galling, kinks, crushes, corrosion, and excessive wear. Slings that appear to be damaged shall be removed from service. The user shall verify that the weight of the load is within the rated capacity of the sling and that the tag indicates a rated load test within the last 4 years (or 1 year for critical lifts).
- b. Safe practices - Kinks, loops, or twists in the legs of slings shall be avoided. The sling must be lifted slowly to avoid shock-loading it, and any sharp corners in contact with the sling shall be padded to minimize damage to it. A sling must never be pulled from under the load when the load is resting on it.

## 20.14 PERSONNEL-LIFTING DEVICES

### 20.14.1 Description

This section applies to crane or hoist-supported devices that are intended to raise or lower personnel. It does not apply to elevators or ground-supported personnel lifts such as personnel-lifts, aerial devices, scissor lifts, and so on. The lifting of personnel for all activities including construction, maintenance, and any such action shall be accomplished in accordance with 29 CFR Part 1926.550 (g), and is deemed a Critical Lift at the GRC.

### 20.14.2 Design hazard analysis

All personnel-lifting devices shall be subjected to a recognized hazard analysis to determine potential sources of danger and to develop resolutions for those conditions that could cause injury, loss of life, damage to property, or impact to the operations that this equipment supports.

### 20.14.3 Testing - Three types of tests are required for personnel-lifting devices:

- a. Proof load test - Before first use, all new, extensively repaired, extensively modified, or altered personnel-lifting devices shall undergo a proof load test at 1.5 times the rated capacity.
- b. Rated load test - Each personnel-lifting device shall be tested at least once every year with a load equal to the rated capacity.
- c. Operational test - When a proof or rated load test is performed, an operational test with rated load shall be performed.

### 20.14.4 Tagging

Following the proof load test, crane- or hoist-supported personnel lifts shall be given a permanently affixed tag with an identity number, the rated capacity (in pounds), proof load applied (in tons), the date of the last rated load test, and the date of the next scheduled rated load test.

### 20.14.5 Operations - Safe operation of a personnel-lifting device requires:

- a. Training - Only personnel having the required training and the authorization of the supervisor shall be permitted to operate a crane- or hoist-supported personnel-lifting device.
- b. Inspection - Prior to use, the operator shall visually inspect the device for mechanical soundness and perform a functional integrity test.
- c. Detailed operating procedures - Detailed technical operating procedures describing personnel-lifting device operation, emergency steps, communication requirements, and special requirements shall be prepared.
- d. Safe egress - A method for safe egress of personnel or emergency lowering to the ground level or other safe location shall be provided.

- e. Fall prevention - Those personnel using personnel-lifting devices are required, where possible, to tie off to approved attachment points that are not on the work cage. Handrails shall not be used as an attachment point.
- f. A rescue plan for retrieval of workers in case of equipment or power failure.

## 20.15 PROGRAMMATIC AUDITS

A designated person from the Safety Branch monitors implementation of this program and assesses the effectiveness of Lifting Device and Equipment Program biennially.

## 20.16 BIBLIOGRAPHY

- Title 29, Code of Federal Regulation, Part. 1910, Occupational Safety and Health Standards.
- ANSI/ASME B30.2, 1990.
- [NASA-STD-8719.9](#)
- Title 29, Code of Federal Regulations, Part 1926 Safety and Health Regulations for Construction

## APPENDIX A

### CRITICAL LIFT TABLE

This table should be used as a guide in determining whether specific loads to be lifted should be classified as critical or non-critical. In some cases, it is the nature of the lift operation itself, rather than the load, which indicates the need to classify the operation as critical. The Safety and Mission Assurance Directorate is responsible for assisting in classifying loads and lift operations, when requested.

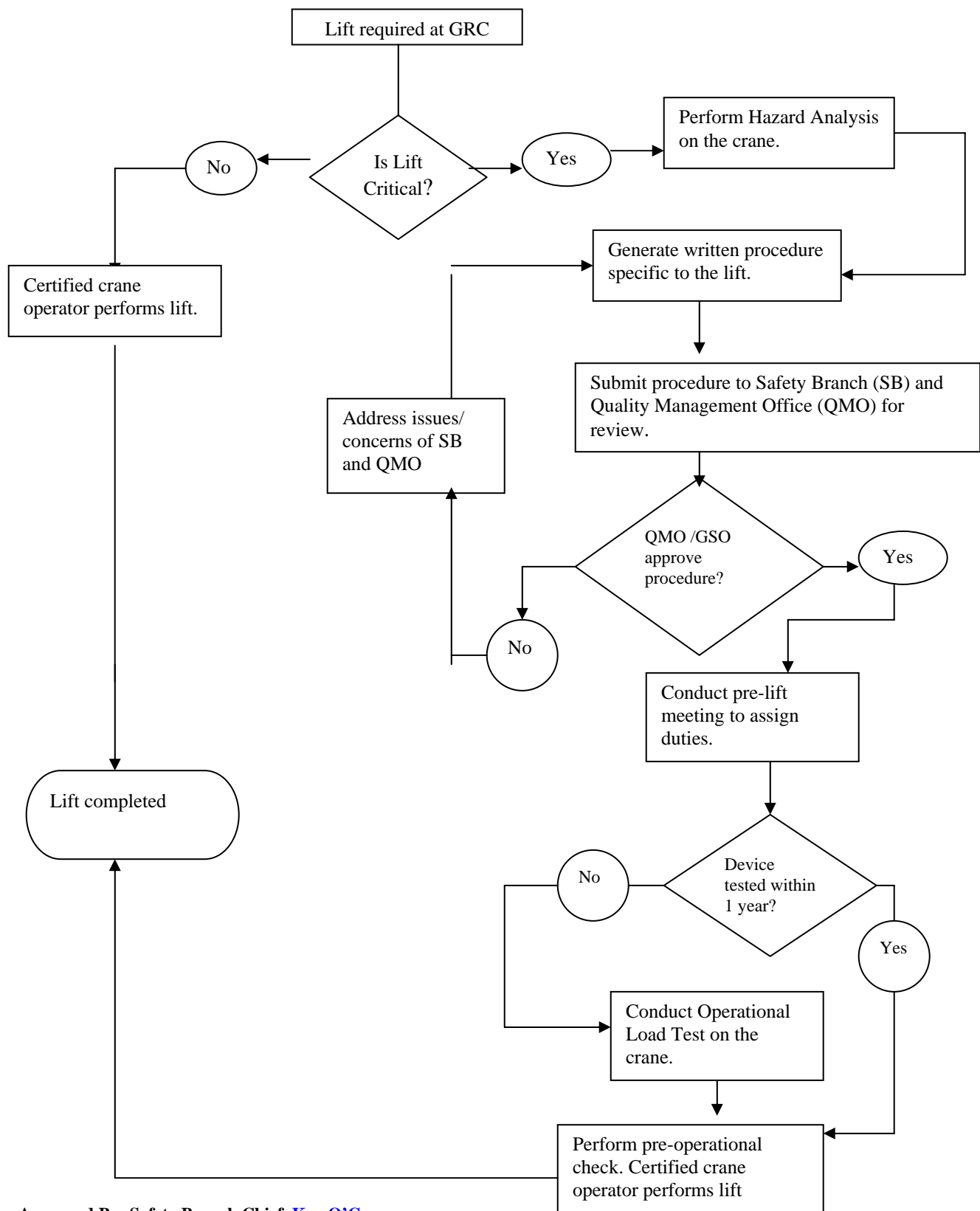
| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Yes | No |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 1. Does the load to be lifted meet one of the following criteria used to define a critical load? <ul style="list-style-type: none"> <li>Assemblies with close tolerances of delicate construction which could be damage by improper handling and such resulting damage could compromise a flight payload, vehicle, or the safety of personnel, regardless of whether the item is considered “Fight Hardware”.</li> <li>Lifting or lowering operations with special, high-dollar items, such as spacecraft, one-of-kind articles, or major facility components, etc., whose loss would have serious programmatic impact?</li> </ul>                                                                                                                                                                                        |     |    |
| 2. Does the planned lifting or lowering operation involve special personnel and device/equipment safety concerns beyond normal lifting hazards, such as the following? <ul style="list-style-type: none"> <li>Lifting/lowering personnel with cranes</li> <li>Lifting/lowering hazardous materials such as explosives</li> <li>Using two or more cranes to lift/lower a single load</li> <li>Operations which required personnel to be beneath a suspended load</li> <li>There is a high probability of damage to the lifting device or equipment which would result in significant repair costs and/or schedule delays for future lift operations</li> <li>The mechanics of the lifting and handling operation itself create a high probability of damage to facilities, devices, equipment, and/or the load?</li> </ul> |     |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |    |

Read both questions presented above, and answer “yes” or “no”. If the response to both questions is “no” the lift operation is classified as **Noncritical**. If the response to at least one question is “yes” the lift operation is classified as **Critical**.

Critical lifts shall comply with NASA Standard 8719.9 Lifting Device and Equipment and Glenn Safety Manual Chapter 20.10.

If a lift is classified as **noncritical**, the project still must adhere to OSHA regulations and NASA STD-8719.9.

## APPENDIX B FLOW CHART FOR CRITICAL LIFTS



**APPENDIX C**  
**CRITICAL LIFT TEMPLATE**  
**NASA GLENN RESEARCH CENTER**

Facility \_\_\_\_\_

**Procedure No.:** \_\_\_\_\_

**CRITICAL LIFTING PROCEDURE**  
**For**

**Purpose for plan:** \_\_\_\_\_

**Date Created:** \_\_\_\_\_

**Current Rev.:** \_\_\_\_\_

**Prepared By:** \_\_\_\_\_

**Procedure**

**Utilized:** \_\_\_\_\_ **for:** \_\_\_\_\_  
*Date* *Description of Lift*

**Required Signatures**

**Facility Manager (NASA):** \_\_\_\_\_

**Print Name      Sign    Date**

**Test Engineer:** \_\_\_\_\_

**Print Name      Sign    Date**

**Project Manager:** \_\_\_\_\_

**Print Name      Sign    Date**

**Quality Assurance Rep. (NASA):** \_\_\_\_\_

**Print Name      Sign    Date**

**Safety Assurance Branch Rep. (NASA):** \_\_\_\_\_

**Print Name      Sign    Date**

Approved By: Safety Branch Chief, [Ken O'Connor](#)  
Chapter Lead: [Frank DeAngelo](#)  
Web Curator: [Deborah Ripley](#), SAIC

## **1.0 OVERVIEW**

The purpose of this document is to establish a reference guide for test specific lifting operations involving equipment identified as critical. The scope of this document covers all lifting of critical equipment related to the specified test or test article taking place within the \_\_\_\_\_ facility at NASA Glenn Research Center.

## **2.0 CRITICAL LIFT DEFINITION**

A critical lift involves lifting and lowering operations involving space-flight hardware, one-of-a-kind articles, lifting of personnel, or major facility components whose loss would have serious programmatic impact. Refer to the **Glenn Safety Manual, Chapter 20** for more information.

## **3.0 CRITICAL LIFT IDENTIFICATION**

The Project Manager is responsible for identifying critical lifts related to a particular test. The Facility Manager and Facility Operations Engineer are responsible for identifying critical lifts of facility components that are not related to a particular test.

For the  (insert program name)  the following equipment to be lifted has been identified as critical:

Critical Equipment List

## **4.0 GENERAL INSTRUCTIONS**

### **4.1 Glenn Safety Manual**

All personnel should be familiar with the **Glenn Safety Manual Chapter 20 – Cranes and Lifting Devices** and in particular **Critical Lift Requirements**. If there are any discrepancies regarding procedures and requirements between this document and the **Glenn Safety Manual (GSM)**, the **GSM** takes precedence.

### **4.2 Personnel**

A Critical Lift Monitor shall be assigned to oversee lifting operations. The Crane Operator all lift riggers shall possess adequate training and certifications as described in the **GSM**. Other personnel required to be on site during critical lift operations include a Project Representative and a Quality Assurance and/or Safety Representative.

### **4.3 Equipment**

All critical lifting equipment shall be accompanied by appropriate documentation that certifies load testing performed less than a year prior to the anticipated completion of critical lifting operations.

A pre-lift meeting shall be held at which the Crane Operator, Lift Rigger(s), Critical Lift Monitor, QA/Safety Representative(s), and all other personnel involved with critical lifting operations will review this procedure including crane operations, communication requirements, test specific requirement (Section 5.0), and emergency procedures (Section 6.0). The review shall also include personnel assignments and responsibilities.

## **5.0 TEST SPECIFIC REQUIREMENTS**

*A brief description of the purpose of the critical lift, including program personnel and responsibilities.*

## **6.0 EMERGENCY PROCEDURE**

In the event of building evacuation or electrical power outage, the crane shall be shut off and locked out. If it can be done so without excessive risk to personnel, the lift coordinator shall ensure that the load is secured and that the area is roped off and marked with signs warning of the suspended load.

## **7.0 PRE-LIFT OPERATIONS**

### **7.1 Personnel Assignments:**

|                     |       |                  |       |
|---------------------|-------|------------------|-------|
| Lift Coordinator:   | _____ | QA Rep.:         | _____ |
| Equipment Operator: | _____ | Safety Rep.:     | _____ |
| Lift Leader:        | _____ | Project Rep:     | _____ |
| Lift Rigger:        | _____ |                  |       |
| Lift Rigger:        | _____ | Other (specify): | _____ |

**7.2** Establish a safety exclusion zone for the lift defined by barriers in order to prevent unauthorized personnel from entering the area.

Coordinator: \_\_\_\_\_

**7.3** Conduct pre-task briefing and assign jobs to personnel. Review emergency procedures, personnel locations during operations, channels of communication, and the lift procedure itself. Also, review the lift specific Job Hazard Analysis (JHA) and the Overhead Crane Hazard Analysis with all personnel. Verify that lift operators and riggers have valid certifications.

Coordinator: \_\_\_\_\_

**7.4** Visually inspect all lifting equipment for certification, damages and completeness.

Coordinator: \_\_\_\_\_

**7.5** Review and verify the weight of all items to be lifted. Coordinator: \_\_\_\_\_

List all items including the description and weight of all items to be lifted.

- 7.6** Lift coordinator shall list all the lifting equipment needed below. Verify all lifting devices have the appropriate capacity and have been certified within the past twelve months including cranes, load positioners, lifting sling assemblies, shackles, load cells, wire rope assemblies, nylon straps, hoist rings, turnbuckles, and tag lines.

Coordinator: \_\_\_\_\_

| Item  | Description | Capacity | Model No. | Serial No. | Cert. Date |
|-------|-------------|----------|-----------|------------|------------|
| _____ | _____       | _____    | _____     | _____      | _____      |
| _____ | _____       | _____    | _____     | _____      | _____      |

- 7.7** Perform engineering/safety walk thru of the area.

Coordinator: \_\_\_\_\_

- 7.8** Perform a functional check out of the crane each day that critical lift operations are to occur. Follow the Crane Pre Operational Checklist at the end of this document. Ensure that the check sheet is completed.

Coordinator: \_\_\_\_\_

**Warning:** The following steps are hazardous because of the lifting operation. No personnel shall be allowed to work or walk beneath a suspended load.

## **8.0 LIFTING PROCEDURE**

| Step No.: | Step Description | Responsible Title:<br>(Technician,<br>Manager) | Step Completed<br>Initials/Date | Comments |
|-----------|------------------|------------------------------------------------|---------------------------------|----------|
|           |                  |                                                |                                 |          |